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Crescentic cracks which are vertical and, like chatter-marks, are concave forward, may be explained as the result of the difference in stress parallel to the rock-face, arising from differential friction.

Crescentic gouges are convex forward (downstream). Those here described measure from a few inches to over six feet across. The gouges generally occur in sets, the members of a set being usually of nearly equal size. They occur on both bottoms and walls of glacial troughs. Crescentic gouges consist of two elements: a gently sloping, incomplete, conoid fracture, on the upstream side; and a subsequent, vertical, crescentic fracture, that forms the downstream side of the gouge. The "conoid" fracture is due to shear from an inclined pressure arising from the downward and forward pressures of the ice, as modified by differential friction. This inclined pressure is thought to have been applied by boulders acting through a thin cushion of débris or of débris-loaded ice, at places where the ice rose over obstructions. The thin wedge formed by this fracture was broken across vertically, and the crescentic wall produced. This second break is due to stress from the upturning of the edge of the wedge when the formation of the first crack relieved it of compression, and the resistance of the ice pressure against this upturning.

The author regards the gouges as the result of "a mechanical rhythm of some sort," and suggests that the constant pressure of the ice may induce a group of mechanical rhythms to accumulate stress and strain within the rock, until the breaking-point is reached and a conoid fracture produced.

C. W. W.

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*Geological Reconnaissance of the Coast of the Olympic Peninsula, Washington.* By RALPH ARNOLD. (Bulletin of the Geological Society of America, Vol. XVII, pp. 451-68; Pls. 55-58.)

This paper gives the preliminary results of the first measurement and study of any comprehensive Tertiary section in the Pacific Northwest.

The topography of the Peninsula is not very well known. Its dominant feature is the Olympic Mountains, a rugged alpine group rising to a maximum elevation of 8,200 feet, and having a local relief of about 7,000 feet. There are no railroads, wagon roads, or trails in the higher mountains, and considerable areas are almost impassable even to a man afoot.

Surrounding the higher mountains, especially on the northwest, west, and south sides is a maturely dissected plain, sloping seaward from elevations of 4,500 to 5,000 feet. The streams crossing this plain, in fact all the streams of the Peninsula, flow nearly straight outward from the central

area of high mountains. This radial drainage is thought to be consequent to some domed surface, probably a peneplain.

The formations involved in the geology of the coastal region of the Olympic Peninsula include serpentine, old diabase or greenstone, metamorphosed sandstone, and quartzite, probably of Jurassic age; 6,000+ feet of gray sandstone with minor quantities of carbonaceous shales, supposed to represent the lower part of the *Puget Group* and of Cretaceous age; 1,200+ feet of basalt tuffs of Eocene age; 15,000 feet of Oligocene-Miocene conglomerate, sandstone and shale; 2,260 feet of Pliocene conglomerate, sandstone, and shale; and at least 300 feet of Pleistocene till, clay, and gravel.

Fossils are abundant in the Tertiary formations. One fauna is described from the Eocene, five from the Oligocene-Miocene, and one from the Pliocene. The peculiar upper Miocene fauna of the Looke beds, which is well developed on Vancouver Island, only 15 miles northward, is conspicuous by its absence.

C. W. W.

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*Contribution to the Geology and Paleontology of Vermont.* By HENRY M. SEELY. From the *Fifth Report Vermont State Geologist*, pp. 1-34, Plates XXXIV-XLV. Montpelier, Vt., 1906.

The greater part of this paper is taken up with description of new species of the so-called genus, *Cryptozoön*. None of the characters assigned to these three new species, *C. steeli*, *C. saxiroseum*, and *C. wingi* differ from structures that may be occasionally observed in undoubted concretions. The reviewer can find no reason for regarding such structures as organic, except to the extent that bacteria or similar organisms may have contributed to the precipitation of the calcite or silica composing them. In fact the only structure in Hall's description of the type species<sup>1</sup> that may be organic is certain doubtful canals, of which he writes: "The substance between the concentric lines, in well-preserved specimens, is traversed by numerous minute irregular canaliculi which branch and anastomose without regularity." The exact nature of these is not clear, but probably they are similar to the "pilae" figured by Seely (Plate XXXVII, Fig. 3) which cannot be distinguished from irregular inorganic segregations common in many concretions, cherts, and limestones.

A startling feature of the paper is the description (p. 12, Plate XXXVII, Figs. 5, 6) of a specialized ovarium with ova in "*Cryptozoön saxiroseum*." That such a structure, so well developed, should exist in so primitive an

<sup>1</sup> James Hall, *Thirty-Sixth Annual Report N. Y. Mus. of Natural History*, transmitted to the legislature, January 12, 1883. (*Cryptozoön proliferum*.)